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Notes:

1. Untranslatable words are replaced with asterisks (****).
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CLAIM + DETAILED DESCRIPTION

[Claim(s)]

[Claim 1] [biodegradable polymer / the hydrophobic organic solvent solution of polymer with which 50-99 w/w% and amphipathic polymer consist of 50-1 w/w%] The honeycomb structured body obtained by evaporating the minute waterdrop which carried out the cast on the substrate under the atmosphere of 50 to 95% of relative humidity, was made to dew on this cast liquid surface while transpiring this organic solvent gradually, and was produced by this dew condensation.

[Claim 2] The film which consists of a honeycomb structured body of Claim 1.

[Claim 3] The honeycomb structured body of Claim 1 said whose biodegradable polymer is aliphatic polyester.

[Claim 4] The base material for cell cultures which consists of a honeycomb structured body according to claim 1.

[Claim 5] The base material for cell cultures according to claim 4 whose diameter of said honeycomb structured body is 0.1-10 micrometers.

[Claim 6] How to prepare a honeycomb structured body by making it dew on this cast liquid surface at the same time it carries out the cast of the hydrophobic organic solvent which carries out 1-50% content of 50-99% and the amphipathic polymer for biodegradable polymer under relative humidity 50-95% of atmosphere on a substrate and transpires this organic solvent gradually.

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This inventions are the foundation of the cell culture which serves as the foundation most in the cell technology and system engineering in which research is

prosperous in recent years in Medical Science Division or the agricultural field, and a thing in connection with application. That is, a scaffold in case the base material which is in charge of culturing a cell, and/or a cell form a three-dimension organism is offered. [0002]

[Description of the Prior Art] In the interaction of a cell and material, it is known that a cell will be influenced not only with the chemical character of a material list side but with detailed form. Then, when aiming at functional control of a cell from viewpoints, such as system engineering, processing of the chemical property of the material list side in contact with a cell and the both sides of detailed structure becomes important. The size control of the cell contact side using the micro pattern technology used for semiconductor industry etc. as surface treatment technology as a surface micro-processing method, Introduction of the minute slot structure to a substratum and production of the detailed convexo-concave by a microsphere are performed, and it is known that a surface fine structure will affect growth of a cell etc. greatly. [0003] Very advanced technology is required for a surface setup using such micro pattern technology, and the present condition is having many problems, such as mass production being impossible and becoming high cost. It is known that the film which has the honeycomb structure of mum scale by carrying out the cast of the dilute solution of the polymer which has structure completely special as another surface patterning technology under high humidity will be obtained. It is the feature that this method is excellent in the economical efficiency which is in charge of patterning. [0004] Specifically in a science and 1999 using polyphenyl quinolinic block polystyrene which is the rod KOIRUJI block polymer which becomes 283 volumes and a page 373 from a hydrophilic block and a hydrophobic block [****] moreover, the jib which will become 369 volumes and a page 387 from polystyrene and poly para-phenylene which is an upright block in Nature and 1994 -- the example using lock polymer is indicated. Thus, at the Prior art, the special polymer having a portion with strong autoagglutination power and the portion which discovers pliability was used, these polymer was dissolved in the hydrophobic organic solvent, and the honeycomb structured body was prepared by carrying out the cast of this. On the other hand, this invention persons are SHINSO lids. Films 1998 327 to 329 volumes, Page 854, Supra molecular science 1998 The 5th volume, a page 331 -- and molecular Crystal Liquid Crystal in 1998 The 322nd volume The acrylamide polymer of hydrophilicity is made a page 305 with a principal chain skeleton. The amphipathic polymer which has a lactose machine or a carboxyl group as the dodecyl and a hydrophilic side chain as a hydrophobic side chain, Or the ion complex of anionic polysaccharides, such as a heparin and dextran sulfate, and long chain alkyl ammonium salt of the 4th class has reported giving the pellicle which has honeycomb structure by the same method. [0005] However, since it was inferior to the self-independence nature of the honeycomb structured body obtained in these polymer or had the fault of honeycomb structure collapsing temporally, it was not what offers function sufficient as a base material for cell cultures. [0006]

[Problem to be solved by the invention] When performing a cell culture in a cell technology, system engineering, etc., the base material used as the scaffold of a cell is required, and it is known like the above-mentioned that a cell will be influenced in the interaction of a cell and material not only with the chemical character on the surface of best but with detailed form. When aiming at functional control of a cell, a design of the chemical property of a material list side and the both sides of structure with a detailed cell in contact with a cell becomes important. With the porous film which has honeycomb structure, a honeycomb pattern offers a cell contact side and it is shown that a vesicular structure serves as access to the support board of a cell and a supply route of nutrition. [0007] If a cell is systematized based on this honeycomb structure film, an artificial organ can be considered as that one usage. However, since embedding inside of the body becomes indispensable when it is made an artificial organ etc., as for this base material, being absorbed to the living body is desirable in the long run. The time which a cell culture takes with the material which gives old honeycomb structure maintains structure stably, and there is nothing that was made from a biodegradable material which is disassembled at more than it. In other words, in combining a honeycomb structured body, a cell technology, and cell culture technology, and developing to medical use ways, such as an artificial organ, it is indispensable to use a biodegradable material. [0008]

[Means for solving problem] As a result of inquiring wholeheartedly in consideration of an above-mentioned technical problem and a problem, this invention person is combining a biodegradable polymer and amphipathic polymer at a suitable rate, economical preparation is possible for him, there is independence nature, and it found out giving a also structurally stable honeycomb structured body. That is, this invention is attained by the following. [0009] (1)

[biodegradable polymer / the hydrophobic organic solvent solution of polymer with which 50-99 w/w% and amphipathic polymer consist of 50-1 w/w%] The honeycomb structured body obtained by evaporating the minute waterdrop which carried out the cast on the substrate under the atmosphere of 50 to 95% of relative humidity, was made to dew on this cast liquid surface while transpiring this organic solvent gradually, and was produced by this dew condensation.

The film which consists of a honeycomb structured body of (2) and (1).

(3) The honeycomb structured body of (3) said whose biodegradable polymer is aliphatic polyester.

The base material for cell cultures which consists of a honeycomb structured body of (4) and (1).

(5) The base material for cell cultures according to claim 4 whose diameter of said honeycomb structured body is 0.1-10 micrometers.

(6) How to prepare a honeycomb structured body by making it dew on this cast liquid surface at the same time it carries out the cast of the hydrophobic organic solvent which carries out 1-

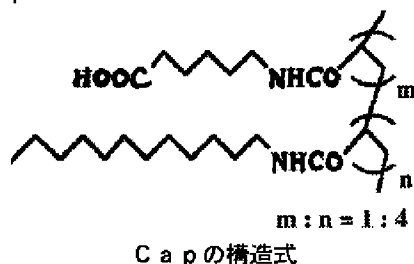
50% content of 50-99% and the amphipathic polymer for biodegradable polymer under relative humidity 50-95% of atmosphere on a substrate and transpires this organic solvent gradually. [0010]

[Mode for carrying out the invention] As biodegradable polymer in this invention, it is polylactic acid. Polyhydroxy butanoic acid, Aliphatic series polycarbonate, such as biodegradable aliphatic polyester, such as poly caprolactone, polyethylene horse mackerel PETO, and a polubutylene adipate, polybutylene carbonate, and polyethylene carbonate, etc. is desirable from a soluble viewpoint to an organic solvent. Polylactic acid and poly caprolactone are desirable from viewpoints, such as ease of acquisition, and a price, especially. [0011] [be / that there is no toxicity if it takes into consideration using as a cell culture base material as amphipathic polymer used for this invention / indispensable] A polyethylene glycol / polypropylene glycol block copolymer, The amphipathic polymer which makes acrylamide polymer a principal chain skeleton and has a lactose machine or a carboxyl group as the dodecyl and a hydrophilic side chain as a hydrophobic side chain, Or it is desirable to use the amphipathic polymer which made the hydrophilic radical water-soluble protein, such as an ion complex of anionic polymers, such as a heparin, dextran sulfate, and nucleic acid of DNA or RNA, and long chain alkyl ammonium salt, gelatin, collagen, and albumin. [0012] In producing the honeycomb structured body of this invention, it is required to be nonaqueous solubility as an organic solvent used from it being indispensable to make minute waterdrop particles form on a polymer solution. As these examples, nonaqueous solubility ketone, such as ester, such as aromatic hydrocarbon, such as halogen system organic solvents, such as chloroform and a methylene chloride, benzene, toluene, and xylene, ethyl acetate, and butyl acetate, and methyl isobutyl ketone, carbon bisulfide, etc. are mentioned. Whether it uses it independently or uses these organic solvents as a solvent mixture which combined these solvents, they are not cared about. the biodegradable polymer which dissolves in these, and the polymer concentration which amphipathic polymer both persons combine -- 0.01 to 10wt% -- it is 0.05 to 5wt% more preferably. The dynamics hardness of the film which will be obtained if polymer concentration is lower than 0.01wt% runs short and is not desirable. Moreover, at more than 10wt%, polymer concentration becomes high too much and sufficient honeycomb structure is not acquired. Moreover, the composition ratio of biodegradable polymer and amphipathic polymer is 99:1 to 50:50 (wt/wt). the honeycomb structure in which an amphipathic polymer ratio is uniform at one or less is not acquired -- moreover -- this -- it is not desirable in order that a ratio may be missing from the stability, especially dynamic stability, of the honeycomb structured body obtained or more by 50. [0013] Although the cast of this polymer organic solvent solution is carried out on a substrate in this invention and a honeycomb structured body is prepared Liquids which were excellent in products made from an organic solvent-proof, such as charges of non-equipments, such as glass, a metal, and a silicon wafer, polypropylene, polyethylene,

and polyether ketone, as this board, such as a polymer, water, liquid paraffin, and liquefied polyether, can be used. Especially, when water is used for a base material, this structure can be independently taken out from a substrate easily by employing efficiently the independence nature which is the feature of this honeycomb structured body, and it is suitable. [0014] The mechanism in which honeycomb structure is formed by this invention is considered as follows. When a hydrophobic organic solvent evaporates, in order to take latent heat, the temperature of the cast philharmonic surface falls, and the drop of minute water condenses and adheres to the polymer solution surface. by work of the hydrophilic portion in a polymer solution, the surface tension between water and a hydrophobic organic solvent decreases, and for this reason, water particulates condense and it becomes one lump -- trying -- the time -- carrying out -- stabilizing -- having . A solvent follows on evaporating and it stands in a line in the form in which the drop which carried out the hexagonal form carried out the closest packing, and finally, water flies and polymer remains as a form regularly located in a line in the shape of a honeycomb. Therefore, it is desirable for relative humidity to be in 50 to 95% of range as environment where this film is prepared. At 50% or less, dew condensation of a up to [a cast film] becomes inadequate, and environmental control is not difficultly desirable at 95% or more. Thus, the size of each of the made honeycomb structured bodies (each) is 0.1 to 10 micrometers, and if it is a size of this range, it can be conveniently used as a base material for cell cultures.

[0015] Hereafter, although this invention is explained in detail using a work example, this invention is not limited at all by this. [0016]

[Working example] The chloro form solution (1.0g/L) of Polly L-lactic acid (molecular weight 85000-160000) and the benzene solution (1.0g/L) of Cap of a formula (I) are mixed at a rate of 1:1, 4:1, and 8:1. (Work example 1-3) The cast was carried out on the glass substrate, it put gently under the room temperature and the condition of 80% of humidity, and the honeycomb structured body was prepared by flying a solvent gradually. In this way, the light microscope photograph of the obtained structure is shown in drawing 1 . These films can be picked up with pincettes and it was checked that free-standing is shown. [Chemical formula 1]



[0017] Milli-Q water (40ml) is put into a petri dish (inside diameter of 9.3cm). (Work example 4) The chloroform solution (1.0g/L) of Polly L-lactic acid (molecular weight 85000-160000) and the benzene solution (1.0g/L) of Cap which is amphipathic polymer were mixed at a rate of 8:1

(wt%), the 20microl was developed on the water surface, and the decay film was produced. Then, this polymer solution of 10 moremicrol was dropped, the drop was made to form, and the honeycomb structured body was produced by applying air of 80% of relative humidity at the speed of 90 ml/min to it. This structure could be dipped up on the frame ($\phi=5\text{mm}$), and has checked free-standing. [0018] (Comparative example 1) Only with the chloro form solution (1.0g/L) of Polly L-lactic acid (molecular weight 85000-160000), adjustment of honeycomb structure was tried by the same operation as a work example 1. Although the result was shown in drawing 2, the mole follow G of the obtained film was heterogeneous.

[0019] (Comparative example 2) Preparation of the honeycomb structured body was tried on a work example 1 and simultaneous conditions only using Cap solution. The film was beaten by this example while minute waterdrop evaporated, and by it, it did not have free-standing.

[0020] (Example 1 of an examination) The honeycomb film obtained in the work example 1 was installed on the glass plate which carried out the Pori HEMA coat, and the cow main artery origin endothelial cell (ECs) was cultured on this. Cultivation was performed using the IMDM medium within the CO₂ incubator (CO₂ concentration =5%, temperature =37 degree C, relative humidity = 80%). Seeding of the ECs was directly carried out on the glass plate of a pHEMA coat as a comparative example, and it cultivated on the same conditions. In the former, it turned out that it pasted up well, the cell is extended and the film of a honeycomb structured body is functioning as a scaffold of a cell. On the other hand by the latter, ECs was not pasted up at all. [0021]

[Effect] As mentioned above, according to the method of this invention, preparation of the honeycomb structured body which used biodegradable polymer as the main ingredients and which was arranged regularly is attained simple, and offer of the film and cell culture base material using this is attained.

[Translation done.]